

## 5. Evaluation and Lessons Learned

DWR quickly bought 821,000 acre-feet of water from farmers, landlords, and water agencies in the winter and spring of 1991. While both the sellers and buyers in the urban and agricultural regions benefited from the trades, concerns arose about potential negative economic impacts in the selling regions. This report examined the impact of the Bank on the local farm economy. We focused our attention on the groups that are likely to be hurt by water sales—the suppliers of farm inputs, the handlers and processors of farm outputs, and local governments.

We estimated that 161,000 acre-feet of the water purchased had no impact on water available to farmers and thus had no negative economic impacts on the local agricultural economy.<sup>1,2</sup> We found that the purchase of the remaining 660,000 acre-feet had significant impacts on the operations of the farmers involved, although the impact varied by type of contract and crop put in the Bank. Farmers reduced their purchases of inputs and their production of outputs.

Even though the impact of the Bank on the participating farmers was significant, the impact on the agricultural sector in the selling regions was not large. We estimated that the Bank caused agricultural activity to be 2 to 3 percent lower in the 11 counties that sold the 660,000 acre-feet to the Bank.<sup>3</sup>

We were unable to detect any negative economic impact on the overall economies of the counties selling water to the Bank. It may be that the large inflow of Bank payments into these counties stimulated the economy and offset many of the negative effects. It may also be that the impact of the Bank relative to the overall county economy was too small to detect given the data available and the many confounding factors, such as the recession, drought, and Christmas 1990 freeze.

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<sup>1</sup>This includes direct groundwater pumping and sales by water agencies that completely offset the sold surface water by groundwater pumping (19,000 acre-feet) and purchases of stored water (142,000 acre-feet).

<sup>2</sup>These purchases did inject money into the local economy and thus did have some positive impacts.

<sup>3</sup>Stanislaus and Tehama counties sold very small amounts of water to the Bank, and they are not included with these 11 counties.

In concluding this report, we first discuss some lessons we have learned on how negative third-party impacts might be reduced in future banks. We then discuss the implications of our findings for setting the purchase price of water and contracting procedures in the future. Finally, we present recommendations for evaluating the 1991 Bank and future banks. These recommendations are made assuming that DWR, or another government agency, continues to play a central role in future banks. However, we also present recommendations that address the government's role in water transfers.

## **Reducing Third-Party Impacts**

### ***Deemphasize Crops with High Impacts on Operating Costs and Downstream Processors***

We found that some crops in the Bank have a much bigger impact on input purchases than others. Of the crops for which we were able to isolate separate effects, we found that rice, sugar beets, and alfalfa had the largest impacts. Ceasing to irrigate pasture had almost no impact on operating costs, and corn and wheat had intermediate impacts. This suggests that DWR could substitute water purchases from lower-impact crops for high-impact crops to reduce third-party impacts. Some caution is necessary, however. To the extent that input suppliers or output processors and handlers specialize in particular crops, focusing bank purchases on a few crops may focus negative impacts on a narrow set of businesses and individuals. If there is considerable specialization, DWR would need to trade off a reduction in overall impacts with the concentration of the impacts in certain sectors.

Stored-water contracts, contracts for direct groundwater pumping, and contracts where an agency pumps groundwater into the distribution system to offset surface water sales fully had no immediate adverse economic impacts on the selling regions. DWR might focus on these types of contracts to reduce third-party impacts,<sup>4</sup> but there are also costs. Increasing groundwater pumping will reduce groundwater levels and increase future pumping costs if long-term extractions exceed replenishment. Excess stored water may not be available in all years, and the amounts that are available may be limited.

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<sup>4</sup>DWR did not sign any no-irrigation contracts in the 1992 Bank. It emphasized stored water, direct groundwater pumping, and groundwater-exchange contracts.

### ***Spread Purchases to Diffuse Negative Economic Impacts***

We found that the negative impacts of the Bank varied substantially by county because of the distribution of water sales and types of crops affected across counties. We also have some anecdotal evidence that impacts were particularly harsh in certain parts of some counties. To reduce negative impacts in any one area, DWR could spread purchases out as widely as possible.

### ***Rotate Farmers in Bank***

Our results suggest that farmers who participated in the Bank increased farm investment. This partially offset the drop in operating costs and reduced the negative impact of the Bank on suppliers of farm inputs. There is likely a limit to the amount of investment that a farmer will do on his or her farm. This suggests that DWR should limit how often a farmer can participate in the Bank. This may take the form of limitations on the number of consecutive years that a farmer can sell water or restrictions on the amount of water per acre in the farm operation that a farmer could sell during a specified period.

### ***Do Not Assume that Groundwater-Exchange Contracts Have No Impact***

Going into this study, we and many others thought that groundwater-exchange contracts would have few adverse impacts, because farmers were supposed to pump groundwater to replace surface water sold to the Bank. While we found that these contracts had little impact on purchases of farm inputs, our results suggest that they caused a decline in farm production. This may be because groundwater is of lower quality than the surface water it replaced. It may also be that there were farmers with groundwater-exchange contracts who would have pumped water even if there had been no Bank and thus did not fully offset reductions in surface-water deliveries.

## **Purchase Price and Contracting Process**

### ***Consider Lowering the Purchase Price of Water***

We estimate that *on average* sellers netted \$35 per acre-foot on water sold through no-irrigation and multiple-response contracts when groundwater was not available and \$17 per acre-foot for groundwater-exchange contracts and

multiple-response contracts where groundwater was available.<sup>5</sup> This suggests that DWR would have found many willing sellers at less than \$125 per acre-foot. How low the price could go to purchase a given quantity of water is unknown, however. DWR was able to purchase 193,000 acre-feet at \$50 an acre-foot in the 1992 Bank, which demonstrates that some people are willing to sell at a much lower price. A lower price in 1991 may have also caused fewer urban and agricultural buyers to withdraw their requests for water later in the year.

A lower price for a given quantity of water, however, may have some drawbacks for the local farm economy. Farmers would have less money for farm investments, and their purchase of goods and services in the local economy would probably not be as large.

### ***Start Bank As Early As Possible and Use Standard Rules and Contracts***

The 1991 Bank did not begin operation until February 1991. Many farmers and businesses told us during interviews that they would have liked the Bank to start earlier so that they could have better planned their operations. DWR could start signing some contracts in November or December, but this may be difficult if buyers are not willing to commit that early.<sup>6,7</sup> An earlier start date will likely have several implications. DWR might be able to pay less for water, because some farmers will not have already incurred preplanting and planting costs. The flip side of this is that third-party impacts may well be higher, since farmers may purchase fewer inputs or harvest a yield that would be lower than would be the case if land were irrigated for more of the season.

Several farmers thought that DWR should make future banks easier to understand and simpler to participate in. DWR could publish a list of rules governing enrollment and use standardized contracts that are published prior to negotiations. This would make it easier for farmers to decide whether they want to participate and would reduce transaction costs.<sup>8</sup>

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<sup>5</sup>This combines income received by farmer, landlord, and water agency.

<sup>6</sup>It is not until the following February or March that reliable information on the water supply situation becomes available and water allocations are made.

<sup>7</sup>A compromise might be options contracts for water that are signed in the fall and exercised in the spring if precipitation is below normal.

<sup>8</sup>DWR eventually used standard contracts for the 1991 Bank, but, not surprisingly, they evolved as DWR gained experience with the Bank.

### ***Require More Information About Black-Box Contracts***

Most groundwater contracts were with water agencies, and, in many cases, DWR knew little about the particular farm operations affected—most notably for the multiple-response contracts. This made it difficult to evaluate the impacts of groundwater contracts. In future banks, it would be desirable for DWR to require more information about participants in these contracts.

### ***Develop Procedures to Ensure That Both Landlords and Tenants Are Included***

Many farmers and businesses thought that the Bank increased divisiveness in the local community. Local businesses were resentful of farmers who sold water to the Bank. Conflicts between landlords and tenants arose over the right to sell water and the proceeds of Bank sales. DWR could adopt criteria for future banks to ensure that tenants and landlords are dealt with fairly. These would ensure that the water sales did not come as a surprise to either party and would help reduce divisiveness caused by future banks.<sup>9</sup>

## **Bank Evaluation**

### ***Continue to Evaluate Economic Impacts of 1991 Bank***

This report has enhanced our understanding of the economic impacts of the 1991 Drought Water Bank on the local farm economy, but the evaluation of the Bank is not complete. The negative impacts in the selling regions must be compared with the positive impacts in the buying regions.<sup>10</sup> Work also needs to be done on whether and how to compensate the parties negatively impacted by the Bank.

### ***Broaden Scope of Evaluation***

The 1991 Bank created a statewide market for water for the first time in California history. As implemented, it was a tightly regulated market, with transactions limited to specific types of contracts and to buyers with critical

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<sup>9</sup>The USDA has such formal standards, known as the "Fair Treatment of Operators, Tenants, and Sharecroppers" rules, which could serve as a model. Although DWR attempted to protect tenants wherever possible in the 1991 Bank, a more defined and uniform early screening process, such as the one DWR required for the 1993 Delta Crop Shift Program, would reduce landlord-tenant conflict.

<sup>10</sup>RAND is currently conducting a study on the impacts of the Bank in the buying regions. The report should be available in early 1994.

water needs. The purchase price was centrally set, and DWR acted as the sole broker for all transactions. Questions about the overall design of the Bank should be raised. Examples of such questions include (1) What role should DWR, or another government agency, play in the market? Third-party impacts and incompletely defined water rights in agricultural areas provide powerful arguments for a large government role. However, this does not mean that the government needs to be the sole broker of all trades. A permitting process may be adequate. (2) Should the purchase and sales prices of future banks be centrally set and fixed throughout the season? As happened in the 1991 Bank, a Purchase Committee-set price may not balance supply and demand. (3) Should DWR restrict water purchases to areas with "critical" water needs, and, if so, how should "critical" be defined?

A well-functioning market rests on well-defined rights to sell water. Currently in agricultural regions, these rights are not fully defined, which explains many of the features of the 1991 Bank. For example, to ensure that farmers reduced surface water use by the amount of water they sold, DWR required farmers to put land in the Water Bank and carefully monitored whether farmers honored the terms of the contract. If water rights and water use were better defined and monitored, this might not have been necessary. How to clarify water rights in a way that would facilitate transfers should also be examined.

Finally, a full evaluation of the Bank requires consideration of the impacts on the environment and groundwater.<sup>11</sup>

### ***Evaluate Future Banks***

Future water banks will undoubtedly be different from the 1991 Bank—they may involve different crops, areas, prices, contract options, and policies toward third parties. Our experience with the 1991 Bank is too limited to predict all of the economic consequences of future Banks. We recommend that DWR continue to evaluate the impact of future banks on local economies.

### ***Collect Information Up Front to Evaluate Future Banks***

Considerable effort went into collecting the information used in this analysis. To facilitate the evaluation of future banks and increase the confidence of future study findings, DWR should consider requiring information on changes in the participants' farm operations as part of the contract. For example, information

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<sup>11</sup>See Coppock and Kreith (1993) for some preliminary work on these impacts.

on a farmer's previous year's operation could be required before an initial payment, and information on the current crop year could be required before the final payment. Because much of this information is sensitive, and confidentiality was key to farmer and business participation in this study, DWR may want to use an objective contractor to receive and verify the data and remove all identifiers before providing it to DWR for analysis. Or, the contractor could also be used by DWR to perform the required analyses, as was done for this study.